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Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/808,199 | JARDIN, CARY A. | |
| | Examiner | Art Unit | |
| | Mahesh H. Dwivedi | 2168 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *23 March 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-57* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-57* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *23 March 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 112*

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claim 47 recites the limitation **"said first portion"** in Page 46. There is insufficient antecedent basis for this limitation in the claim.

Claim 47 recites the limitation **"said first database table"** in Page 46. There is insufficient antecedent basis for this limitation in the claim.

Claim 47 recites the limitation **"said second database table"** in Page 46. There is insufficient antecedent basis for this limitation in the claim.

Claim 47 recites the limitation **"said second portion"** in Page 47. There is insufficient antecedent basis for this limitation in the claim.

Claim 48 is rejected for incorporating the deficiencies of claim 47.

### *Claim Objections*

3. Claim 22 is objected to because of the following informalities: The applicant is reminded that all claims must end with a period. Appropriate correction is required.

Claim 23 is objected to for incorporating the deficiencies of claim 22.

### *Claim Rejections - 35 USC § 102*

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent

granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. Claims 1-57 are rejected under 35 U.S.C. 102(e) as being anticipated by **Luo et al.** (U.S. Patent 7,085,769).

6. Regarding claim 1, **Luo** teaches a distributed computing system comprising:

A) a first logical processor having an associated first storage area and configured to store a first portion of a first database table and a first portion of a second database table (Column 3, lines 65-67-Column 4, lines 1-16, Figures 2 and 4);

B) a second logical processor having an associated second storage area and configured to store a second portion of said first database table and a second portion of said second database table (Column 3, lines 65-67-Column 4, lines 1-16, Figures 2 and 4); and

C) a primary controller coupled to said first logical processor and said second logical processor and configured to receive a database query command (Column 3, lines 59-64, Figures 2 and 4);

D) determine a join table definition in response to said database query command (Column 5, lines 36-52, Figure 4);

E) said join table definition comprising a subset of said first database table to include in executing said database query command (Column 5, lines 36-52, Figure 4); and

F) transmit said join table definition to said first logical processor and said second logical processor (Column 5, lines 36-52, Figure 4).

The examiner notes that **Luo** teaches **"a first logical processor having an associated first storage area and configured to store a first portion of a first database table and a first portion of a second database table"** as "A first table 14, called table A, includes tuples 12, also known as rows, in which tuples are distributed on the two nodes 10*a* and 10*b*. Tuples 12*a* of table A ($T_A$) are found on one node 10*a*, while the remaining tuples 12*b* of table A are found on another node 10*b*. Likewise, a second table 14, called table B, includes tuples 12' ($T_B$) are also distributed on at least two nodes 10*a* and 10*b*. One set of tuples 12*a*' of table B are on one node 10*a* while the remaining tuples 12*b*' of table B are on another node 10*b*" (Column 3, lines 65-67-Column 4, lines 1-6). The examiner further notes that **Luo** teaches **"a second logical processor having an associated second storage area and configured to store a second portion of said first database table and a second portion of said second database table"** as "A first table 14, called table A, includes tuples 12, also known as rows, in which tuples are distributed on the two nodes 10*a* and 10*b*. Tuples 12*a* of table A ($T_A$) are found on one node 10*a*, while the remaining tuples 12*b* of table A are found on another node 10*b*. Likewise, a second table 14, called table B, includes tuples 12' ($T_B$) are also distributed on at least two nodes 10*a* and 10*b*. One set of tuples 12*a*' of table B are on one node 10*a* while the remaining tuples 12*b*' of table B are on another node 10*b*" (Column 3, lines 65-67-Column 4, lines 1-6). The examiner further notes that **Luo** teaches **"a primary controller coupled to said first logical processor and said**

**second logical processor and configured to receive a database query command"** as "Each node 10 includes a processor 30, for executing application programs, such as database management software" (Column 3, lines 62-64). The examiner further notes that **Luo** teaches **"determine a join table definition in response to said database query command"** as "each tuple 14 uses a split vector 15 (V) to redistribute the tuples 12, as illustrated in FIG. 4. For a join operation involving table A and table B, for example, split vector V redistributes tuples $T_A$ and $T_B$, respectively, to nodes 10" (Column 5, lines 41-45). The examiner further notes that **Luo** teaches **"said join table definition comprising a subset of said first database table to include in executing said database query command"** as "the split vector 15 operates upon the join attribute 13 for each tuple $T_A$ and $T_B$. Based on the join attribute value, such as attribute c of table A (A.c), the split vector 15 divides the tuples TA into partitions" (Column 5, lines 47-50). The examiner further notes that **Luo** teaches **"transmit said join table definition to said first logical processor and said second logical processor"** as "each tuple 14 uses a split vector 15 (V) to redistribute the tuples 12, as illustrated in FIG. 4. For a join operation involving table A and table B, for example, split vector V redistributes tuples $T_A$ and $T_B$, respectively, to nodes 10" (Column 5, lines 41-45).

Regarding claim 2, **Luo** further teaches a distributed computing system comprising:

A) wherein said first logical processor is further configured to generate a first join table from said first portion of said first database table in accordance with said join table definition (Column 7, lines 19-24); and

B) said second logical processor is further configured to generate a second join table from said second portion of said first database table in accordance with said join table definition (Column 7, lines 19-24).

The examiner notes that **Luo** teaches **"wherein said first logical processor is further configured to generate a first join table from said first portion of said first database table in accordance with said join table definition"** as "entry 22*a* from hash table 20*a* processes tuples 12 for table A while entry 22*b* from hash table 20*b* processes tuples 12' for table B" (Column 7, lines 19-22). The examiner further notes that **Luo** teaches **"said second logical processor is further configured to generate a second join table from said second portion of said first database table in accordance with said join table definition"** as "entry 22*a* from hash table 20*a* processes tuples 12 for table A while entry 22*b* from hash table 20*b* processes tuples 12' for table B" (Column 7, lines 19-22).

Regarding claim 3, **Luo** further teaches a distributed computing system comprising:

A) wherein said first logical processor is further configured to execute said database query command by comparing said first portion of said second database table with said first join table to generate a first intermediate results file (Column 7, lines 33-39); and

B) said second logical processor is further configured to execute said database query command by comparing said second portion of said second database table with said second join table to generate a second intermediate results file (Column 7, lines 33-39).

The examiner notes that **Luo** teaches **"wherein said first logical processor is further configured to execute said database query command by comparing said first portion of said second database table with said first join table to generate a first intermediate results file"** as "the tuple $T_A$ is inserted into $MP_A$ , then joined with the tuples in the memory part of the $j^{th}$ entry of table B. In other words, each time a tuple $T_A$ arrives at the memory part of the $j^{th}$ entry of $MP_{AJ}$ , the tuple $T_A$ is joined with all the tuples in $MP_{BJ}$" (Column 7, lines 33-37). The examiner further notes that **Luo** teaches **"said second logical processor is further configured to execute said database query command by comparing said second portion of said second database table with said second join table to generate a second intermediate results file"** as "the tuple $T_A$ is inserted into $MP_A$ , then joined with the tuples in the memory part of the $j^{th}$ entry of table B. In other words, each time a tuple $T_A$ arrives at the memory part of the $j^{th}$ entry of $MP_{AJ}$ , the tuple $T_A$ is joined with all the tuples in $MP_{BJ}$" (Column 7, lines 33-37).

Regarding claim 4, **Luo** further teaches a distributed computing system comprising:

A) wherein said first logical processor is further configured to compare said first portion of said second database table with said second join table to generate said first intermediate results file (Column 7, lines 40-44); and

B) said second logical processor is further configured to compare said second portion of said second database table with said first join table to generate said second intermediate results file (Column 7, lines 40-44).

The examiner notes that **Luo** teaches **"wherein said first logical processor is further configured to compare said first portion of said second database table with said second join table to generate said first intermediate results file"** as ""the tuple $T_B$ arrives at the node, $T_B$ is inserted into $MP_B$, then joined with the tuples in the memory part of the $j^{th}$ entry of table A, as also depicted in FIG. 7. In other words, each time a tuple $T_B$ arrives at the memory part of the $j^{th}$ entry $MP_{BJ}$, the tuple $T_B$ is joined with all the tuples in $MP_{AJ}$" (Column 7, lines 40-45). The examiner further notes that **Luo** teaches **"said second logical processor is further configured to compare said second portion of said second database table with said first join table to generate said second intermediate results file"** as ""the tuple $T_B$ arrives at the node, $T_B$ is inserted into $MP_B$, then joined with the tuples in the memory part of the $j^{th}$ entry of table A, as also depicted in FIG. 7. In other words, each time a tuple $T_B$ arrives at the memory part of the $j^{th}$ entry $MP_{BJ}$, the tuple $T_B$ is joined with all the tuples in $MP_{AJ}$" (Column 7, lines 40-45).

Regarding claim 5, **Luo** further teaches a distributed computing system comprising:

A) wherein said primary controller is further configured to generate a final results file from said first intermediate results file and said second intermediate results file (Column 9, lines 7-10).

The examiner notes that **Luo** teaches **"wherein said primary controller is further configured to generate a final results file from said first intermediate results file and said second intermediate results file"** as "Once all tuples $T_A$ and $T_B$ in the entry pair have been joined, the in-memory hash table $H_{DP}$ is freed and the operation is performed on a new entry pair $E_{AB}$, chosen randomly from the hash tables $H_A$ and $H_B$" (Column 9, lines 7-10).

Regarding claim 6, **Luo** further teaches a distributed computing system comprising:

A) wherein said primary controller is further configured to perform a post processing operation on said final results file (Column 9, lines 11-14).

The examiner notes that **Luo** teaches **"wherein said primary controller is further configured to perform a post processing operation on said final results file"** as "The analogous operations of the third stage may be performed for the case where $MP_{BJ}$ became full before $MP_{AJ}$ did" (Column 9, lines 11-13).

Regarding claim 7, **Luo** further teaches a distributed computing system comprising:

A) wherein said first portion of said first database table and said second portion of said first database table are substantially equal portions (Column 4, lines 7-16, Figures 2 and 4); and

A) said first portion of said second database table and said second portion of said second database table are substantially equal portions (Column 4, lines 7-16, Figures 2 and 4).

The examiner notes that **Luo** teaches **"wherein said first portion of said first database table and said second portion of said first database table are substantially equal portions"** as "In one embodiment, the tuples 12 of each table 14 are distributed, as evenly as possible across all the nodes 10 of the parallel RDBMS" (Column 4, lines 8-11). The examiner further notes that **Luo** teaches **"said first portion of said second database table and said second portion of said second database table are substantially equal portions"** as "In one embodiment, the tuples 12 of each table 14 are distributed, as evenly as possible across all the nodes 10 of the parallel RDBMS" (Column 4, lines 8-11).

Regarding claim 8, **Luo** further teaches a distributed computing system comprising:

A) wherein said first storage area and said second storage area are volatile memory areas (Column 2, lines 42-50, Column 4, lines 7-16).

The examiner notes that **Luo** teaches **"wherein said first storage area-and said second storage area are volatile memory areas"** as "The tuple is typically retrieved to a volatile location, such as a memory, during query processing" (Column 2, lines 47-49).

Regarding claim 9, **Luo** further teaches a distributed computing system comprising:

A) wherein said volatile memory areas comprise random access memory (Column 2, lines 42-50, Column 4, lines 7-16).

The examiner notes that **Luo** teaches **"wherein said volatile memory areas comprise random access memory"** as "The tuple is typically retrieved to a volatile location, such as a memory, during query processing" (Column 2, lines 47-49).

Regarding claim 10, **Luo** further teaches a distributed computing system comprising:

A) a third logical processor having an associated third storage area and configured to store a third portion of a first database table and a third portion of a second database table (Column 4, lines 7-16, Figures 2 and 4).

The examiner notes that **Luo** teaches **"a third logical processor having an associated third storage area and configured to store a third portion of a first database table and a third portion of a second database table"** as "Both tables 14 may have additional tuples 12, distributed to additional nodes 10 of the parallel RDBMS

100. In one embodiment, the tuples 12 of each table 14 are distributed, as evenly as possible across all the nodes 10 of the parallel RDBMS" (Column 4, lines 7-11).

Regarding claim 11, **Luo** teaches a distributed computing system comprising:

A) a first logical processor having an associated first storage area and configured to store a first portion of a first database table and a first portion of a second database table (Column 3, lines 65-67-Column 4, lines 1-16, Figures 2 and 4);

B) a second logical processor having an associated second storage area and configured to store a second portion of said first database table and a second portion of said second database table (Column 3, lines 65-67-Column 4, lines 1-16, Figures 2 and 4); and

C) a primary controller coupled to said first logical processor and said second logical processor and configured to receive a primary query command (Column 3, lines 59-64, Figures 2 and 4);

D) transmit a secondary query command corresponding to said primary query command to said first logical processor (Column 4, lines 13-24);

E) receive a first intermediate results file from said first logical processor and a second intermediate results file from said second logical processor (Column 7, lines 33-39); and

F) generate a final results file from said first intermediate results file and said second intermediate results file (Column 9, lines 7-10).

The examiner notes that **Luo** teaches **"a first logical processor having an associated first storage area and configured to store a first portion of a first**

**database table and a first portion of a second database table"** as "A first table 14, called table A, includes tuples 12, also known as rows, in which tuples are distributed on the two nodes 10*a* and 10*b*. Tuples 12*a* of table A ($T_A$) are found on one node 10*a*, while the remaining tuples 12*b* of table A are found on another node 10*b*. Likewise, a second table 14, called table B, includes tuples 12' ($T_B$) are also distributed on at least two nodes 10*a* and 10*b*. One set of tuples 12*a*' of table B are on one node 10*a* while the remaining tuples 12*b*' of table B are on another node 10*b*" (Column 3, lines 65-67-Column 4, lines 1-6). The examiner further notes that **Luo** teaches **"a second logical processor having an associated second storage area and configured to store a second portion of said first database table and a second portion of said second database table"** as "A first table 14, called table A, includes tuples 12, also known as rows, in which tuples are distributed on the two nodes 10*a* and 10*b*. Tuples 12*a* of table A ($T_A$) are found on one node 10*a*, while the remaining tuples 12*b* of table A are found on another node 10*b*. Likewise, a second table 14, called table B, includes tuples 12' ($T_B$) are also distributed on at least two nodes 10*a* and 10*b*. One set of tuples 12*a*' of table B are on one node 10*a* while the remaining tuples 12*b*' of table B are on another node 10*b*" (Column 3, lines 65-67-Column 4, lines 1-6). The examiner further notes that **Luo** teaches **"a primary controller coupled to said first logical processor and said second logical processor and configured to receive a primary query command"** as "Each node 10 includes a processor 30, for executing application programs, such as database management software" (Column 3, lines 62-64). The examiner further notes that **Luo** teaches **"transmit a secondary query command corresponding to said**

**primary query command to said first logical processor"** as "Each node 10 additionally includes a memory 18, to which the tuples 12 may be transferred, such as during a join or other query processing operation" (Column 4, lines 13-16). The examiner further notes that **Luo** teaches **"receive a first intermediate results file from said first logical processor and a second intermediate results file from said second logical processor"** as "the tuple $T_A$ is inserted into $MP_A$ , then joined with the tuples in the memory part of the $j^{th}$ entry of table B. In other words, each time a tuple $T_A$ arrives at the memory part of the $j^{th}$ entry of $MP_{AJ}$ , the tuple $T_A$ is joined with all the tuples in $MP_{BJ}$" (Column 7, lines 33-37). The examiner further notes that **Luo** teaches **"generate a final results file from said first intermediate results file and said second intermediate results file"** as "Once all tuples $T_A$ and $T_B$ in the entry pair have been joined, the in-memory hash table $H_{DP}$ is freed and the operation is performed on a new entry pair $E_{AB}$, chosen randomly from the hash tables $H_A$ and $H_B$" (Column 9, lines 7-10).

Regarding claim 12, **Luo** further teaches a distributed computing system comprising:

A) wherein said primary controller is further configured to determine a join table definition in response to said primary query command (Column 5, lines 36-52, Figure 4);

B) said join table definition comprising a subset of said first database table to include in executing said primary query command (Column 5, lines 36-52, Figure 4).

The examiner notes that **Luo** teaches **"wherein said primary controller is further configured to determine a join table definition in response to said primary query command"** as "each tuple 14 uses a split vector 15 (V) to redistribute the tuples 12, as illustrated in FIG. 4. For a join operation involving table A and table B, for example, split vector V redistributes tuples $T_A$ and $T_B$, respectively, to nodes 10" (Column 5, lines 41-45). The examiner further notes that **Luo** teaches **"said join table definition comprising a subset of said first database table to include in executing said primary query command"** as "the split vector 15 operates upon the join attribute 13 for each tuple $T_A$ and $T_B$. Based on the join attribute value, such as attribute c of table A (A.c), the split vector 15 divides the tuples TA into partitions" (Column 5, lines 47-50).

Regarding claim 13, **Luo** further teaches a distributed computing system comprising:

A) wherein said first logical processor is further configured to generate a first join table from said first portion of said first database table in accordance with said join table definition (Column 7, lines 19-24); and

B) said second logical processor is further configured to generate a second join table from said second portion of said first database table in accordance with said join table definition (Column 7, lines 19-24).

The examiner notes that **Luo** teaches **"wherein said first logical processor is further configured to generate a first join table from said first portion of said first**

**database table in accordance with said join table definition"** as "entry 22*a* from hash table 20*a* processes tuples 12 for table A while entry 22*b* from hash table 20*b* processes tuples 12' for table B" (Column 7, lines 19-22). The examiner further notes that **Luo** teaches **"said second logical processor is further configured to generate a second join table from said second portion of said first database table in accordance with said join table definition"** as "entry 22*a* from hash table 20*a* processes tuples 12 for table A while entry 22*b* from hash table 20*b* processes tuples 12' for table B" (Column 7, lines 19-22).

Regarding claim 14, **Luo** further teaches a distributed computing system comprising:

A) wherein said first logical processor is further configured to execute said secondary query command by comparing said first portion of said second database table with said first join table to generate a first intermediate results file (Column 7, lines 33-39); and

B) said second logical processor is further configured to execute said secondary query command by comparing said second portion of said second database table with said second join table to generate a second intermediate results file (Column 7, lines 33-39).

The examiner notes that **Luo** teaches **"wherein said first logical processor is further configured to execute said secondary query command by comparing said first portion of said second database table with said first join table to generate a first intermediate results file"** as "the tuple $T_A$ is inserted into $MP_A$ , then joined with the tuples in the memory part of the $j^{th}$ entry of table B. In other words, each time a

tuple $T_A$ arrives at the memory part of the $j^{th}$ entry of $MP_{AJ}$ , the tuple $T_A$ is joined with all the tuples in $MP_{BJ}$" (Column 7, lines 33-37). The examiner further notes that **Luo** teaches **"said second logical processor is further configured to execute said secondary query command by comparing said second portion of said second database table with said second join table to generate a second intermediate results file"** as "the tuple $T_A$ is inserted into $MP_A$ , then joined with the tuples in the memory part of the $j^{th}$ entry of table B. In other words, each time a tuple $T_A$ arrives at the memory part of the $j^{th}$ entry of $MP_{AJ}$ , the tuple $T_A$ is joined with all the tuples in $MP_{BJ}$" (Column 7, lines 33-37).

Regarding claim 15, **Luo** further teaches a distributed computing system comprising:

A) wherein said first logical processor is further configured to compare said first portion of said second database table with said second join table to generate said first intermediate results file (Column 7, lines 40-44); and

B) said second logical processor is further configured to compare said second portion of said second database table with said first join table to generate said second intermediate results file (Column 7, lines 40-44).

The examiner notes that **Luo** teaches **"wherein said first logical processor is further configured to compare said first portion of said second database table with said second join table to generate said first intermediate results file"** as ""the tuple $T_B$ arrives at the node, $T_B$ is inserted into $MP_B$, then joined with the tuples in the

memory part of the $j^{th}$ entry of table A, as also depicted in FIG. 7. In other words, each time a tuple $T_B$ arrives at the memory part of the $j^{th}$ entry $MP_{BJ}$, the tuple $T_B$ is joined with all the tuples in $MP_{AJ}$" (Column 7, lines 40-45). The examiner further notes that **Luo** teaches **"said second logical processor is further configured to compare said second portion of said second database table with said first join table to generate said second intermediate results file"** as ""the tuple $T_B$ arrives at the node, $T_B$ is inserted into $MP_B$, then joined with the tuples in the memory part of the $j^{th}$ entry of table A, as also depicted in FIG. 7. In other words, each time a tuple $T_B$ arrives at the memory part of the $j^{th}$ entry $MP_{BJ}$, the tuple $T_B$ is joined with all the tuples in $MP_{AJ}$" (Column 7, lines 40-45).

Regarding claim 16, **Luo** further teaches a distributed computing system comprising:

A) wherein said secondary query command is a standard query language (SQL) database query command (Column 1, lines 18-23, Column 4, lines 19-25).

The examiner notes that **Luo** teaches **"wherein said secondary query command is a standard query language (SQL) database query command"** as "a common command for accessing data is a Structured Query Language (SQL) "select" query" (Column 1, lines 20-21" and "In the following example SQL query, an equi-join between two tables A and B is performed" (Column 4, lines 19-20).

Regarding claim 17, **Luo** further teaches a distributed computing system comprising:

A) wherein said primary controller is further configured to perform a post processing operation on said final results file (Column 9, lines 11-14).

The examiner notes that **Luo** teaches **"wherein said primary controller is further configured to perform a post processing operation on said final results file"** as "The analogous operations of the third stage may be performed for the case where $MP_{BJ}$ became full before $MP_{AJ}$ did" (Column 9, lines 11-13).

Regarding claim 18, **Luo** further teaches a distributed computing system comprising:

A) wherein said first portion of said first database table and said second portion of said first database table are substantially equal portions (Column 4, lines 7-16, Figures 2 and 4); and

A) said first portion of said second database table and said second portion of said second database table are substantially equal portions (Column 4, lines 7-16, Figures 2 and 4).

The examiner notes that **Luo** teaches **"wherein said first portion of said first database table and said second portion of said first database table are substantially equal portions"** as "In one embodiment, the tuples 12 of each table 14 are distributed, as evenly as possible across all the nodes 10 of the parallel RDBMS" (Column 4, lines 8-11). The examiner further notes that **Luo** teaches **"said first**

**portion of said second database table and said second portion of said second database table are substantially equal portions"** as "In one embodiment, the tuples 12 of each table 14 are distributed, as evenly as possible across all the nodes 10 of the parallel RDBMS" (Column 4, lines 8-11).

Regarding claim 19, **Luo** further teaches a distributed computing system comprising:

A) wherein said first storage area and said second storage area are volatile memory areas (Column 2, lines 42-50, Column 4, lines 7-16).

The examiner notes that **Luo** teaches **"wherein said first storage area-and said second storage area are volatile memory areas"** as "The tuple is typically retrieved to a volatile location, such as a memory, during query processing" (Column 2, lines 47-49).

Regarding claim 20, **Luo** further teaches a distributed computing system comprising:

A) wherein said volatile memory areas comprise random access memory (Column 2, lines 42-50, Column 4, lines 7-16).

The examiner notes that **Luo** teaches **"wherein said volatile memory areas comprise random access memory"** as "The tuple is typically retrieved to a volatile location, such as a memory, during query processing" (Column 2, lines 47-49).

Regarding claim 21, **Luo** further teaches a distributed computing system comprising:

A) a third logical processor having an associated third storage area and configured to store a third portion of a first database table and a third portion of a second database table (Column 4, lines 7-16, Figures 2 and 4).

The examiner notes that **Luo** teaches **"a third logical processor having an associated third storage area and configured to store a third portion of a first database table and a third portion of a second database table"** as "Both tables 14 may have additional tuples 12, distributed to additional nodes 10 of the parallel RDBMS 100. In one embodiment, the tuples 12 of each table 14 are distributed, as evenly as possible across all the nodes 10 of the parallel RDBMS" (Column 4, lines 7-11).

Regarding claim 22, **Luo** further teaches a distributed computing system comprising:

A) wherein said primary query command is a standard query language (SQL) database query command (Column 1, lines 18-23, Column 4, lines 19-25).

The examiner notes that **Luo** teaches **"wherein said primary query command is a standard query language (SQL) database query command"** as "a common command for accessing data is a Structured Query Language (SQL) "select" query" (Column 1, lines 20-21" and "In the following example SQL query, an equi-join between two tables A and B is performed" (Column 4, lines 19-20).

Regarding claim 23, **Luo** further teaches a distributed computing system comprising:

A) wherein said secondary query command is a standard query language (SQL) database query command (Column 1, lines 18-23, Column 4, lines 19-25).

The examiner notes that **Luo** teaches **"wherein said secondary query command is a standard query language (SQL) database query command"** as "a common command for accessing data is a Structured Query Language (SQL) "select" query" (Column 1, lines 20-21" and "In the following example SQL query, an equi-join between two tables A and B is performed" (Column 4, lines 19-20).

Regarding claim 24, **Luo** further teaches a distributed computing system comprising:

A) wherein said secondary query command is a standard query language (SQL) database query command (Column 1, lines 18-23, Column 4, lines 19-25).

The examiner notes that **Luo** teaches **"wherein said secondary query command is a standard query language (SQL) database query command"** as "a common command for accessing data is a Structured Query Language (SQL) "select" query" (Column 1, lines 20-21" and "In the following example SQL query, an equi-join between two tables A and B is performed" (Column 4, lines 19-20).

Regarding claim 25, **Luo** teaches a distributed computing system comprising:

A) a first node having a first processor and a first volatile main memory and configured to store a first portion of a first database table and a first portion of a second database table (Column 3, lines 65-67-Column 4, lines 1-16, Figures 2 and 4); and

B) a second node having a second processor and a second volatile main memory and configured to store a second portion of said first database table and a second portion of said second database table (Column 3, lines 65-67-Column 4, lines 1-16, Figures 2 and 4);

C) said second node coupled to said first node (Column 4, lines 7-16, Figures 2 and 4); and

D) a primary controller on said second node configured to receive a database query command (Column 3, lines 59-64, Figures 2 and 4);

E) determine a join table definition in response to said database query command (Column 5, lines 36-52, Figure 4);

F) said join table definition comprising a subset of said first database table to include in executing said database query command (Column 5, lines 36-52, Figure 4); and

G) transmit said join table definition to said first processor and said second processor (Column 5, lines 36-52, Figure 4).

The examiner notes that **Luo** teaches **"a first node having a first processor and a first volatile main memory and configured to store a first portion of a first database table and a first portion of a second database table"** as "A first table 14, called table A, includes tuples 12, also known as rows, in which tuples are distributed on the two nodes 10*a* and 10*b*. Tuples 12*a* of table A ($T_A$) are found on one node 10*a*,

while the remaining tuples 12*b* of table A are found on another node 10*b*. Likewise, a second table 14, called table B, includes tuples 12' ($T_B$) are also distributed on at least two nodes 10*a* and 10*b*. One set of tuples 12*a*' of table B are on one node 10*a* while the remaining tuples 12*b*' of table B are on another node 10*b*" (Column 3, lines 65-67-Column 4, lines 1-6). The examiner further notes that **Luo** teaches **"a second node having a second processor and a second volatile main memory and configured to store a second portion of said first database table and a second portion of said second database table"** as "A first table 14, called table A, includes tuples 12, also known as rows, in which tuples are distributed on the two nodes 10*a* and 10*b*. Tuples 12*a* of table A ($T_A$) are found on one node 10*a*, while the remaining tuples 12*b* of table A are found on another node 10*b*. Likewise, a second table 14, called table B, includes tuples 12' ($T_B$) are also distributed on at least two nodes 10*a* and 10*b*. One set of tuples 12*a*' of table B are on one node 10*a* while the remaining tuples 12*b*' of table B are on another node 10*b*" (Column 3, lines 65-67-Column 4, lines 1-6). The examiner further notes that **Luo** teaches **"said second node coupled to said first node"** as "Both tables 14 may have additional tuples 12, distributed to additional nodes 10 of the parallel RDBMS 100" (Column 4, lines 7-8). The examiner further notes that **Luo** teaches **"a primary controller on said second node configured to receive a database query command"** as "Each node 10 includes a processor 30, for executing application programs, such as database management software" (Column 3, lines 62-64). The examiner further notes that **Luo** teaches **"determine a join table definition in response to said database query command"** as "each tuple 14 uses a split vector

15 (V) to redistribute the tuples 12, as illustrated in FIG. 4. For a join operation involving table A and table B, for example, split vector V redistributes tuples $T_A$ and $T_B$, respectively, to nodes 10" (Column 5, lines 41-45). The examiner further notes that **Luo** teaches **"said join table definition comprising a subset of said first database table to include in executing said database query command"** as "the split vector 15 operates upon the join attribute 13 for each tuple $T_A$ and $T_B$. Based on the join attribute value, such as attribute c of table A (A.c), the split vector 15 divides the tuples TA into partitions" (Column 5, lines 47-50). The examiner further notes that **Luo** teaches **"transmit said join table definition to said first processor and said second processor"** as "each tuple 14 uses a split vector 15 (V) to redistribute the tuples 12, as illustrated in FIG. 4. For a join operation involving table A and table B, for example, split vector V redistributes tuples $T_A$ and $T_B$, respectively, to nodes 10" (Column 5, lines 41-45).

Regarding claim 26, **Luo** further teaches a distributed computing system comprising:

A) wherein said first node is further configured to generate a first join table from said first portion of said first database table in accordance with said join table definition (Column 7, lines 19-24); and

B) said second node is further configured to generate a second join table from said second portion of said first database table in accordance with said join table definition (Column 7, lines 19-24).

The examiner notes that **Luo** teaches **"wherein said first node is further configured to generate a first join table from said first portion of said first database table in accordance with said join table definition"** as "entry 22*a* from hash table 20*a* processes tuples 12 for table A while entry 22*b* from hash table 20*b* processes tuples 12' for table B" (Column 7, lines 19-22). The examiner further notes that **Luo** teaches **"said second node is further configured to generate a second join table from said second portion of said first database table in accordance with said join table definition"** as "entry 22*a* from hash table 20*a* processes tuples 12 for table A while entry 22*b* from hash table 20*b* processes tuples 12' for table B" (Column 7, lines 19-22).

Regarding claim 27, **Luo** further teaches a distributed computing system comprising:

A) wherein said first node is further configured to execute said database query command by comparing said first portion of said second database table with said first join table to generate a first intermediate results file (Column 7, lines 33-39); and

B) said second node is further configured to execute said database query command by comparing said second portion of said second database table with said second join table to generate a second intermediate results file (Column 7, lines 33-39).

The examiner notes that **Luo** teaches **"wherein said first node is further configured to execute said database query command by comparing said first portion of said second database table with said first join table to generate a first**

**intermediate results file"** as "the tuple $T_A$ is inserted into $MP_A$ , then joined with the tuples in the memory part of the $j^{th}$ entry of table B. In other words, each time a tuple $T_A$ arrives at the memory part of the $j^{th}$ entry of $MP_{AJ}$ , the tuple $T_A$ is joined with all the tuples in $MP_{BJ}$" (Column 7, lines 33-37). The examiner further notes that **Luo** teaches **"said second node is further configured to execute said database query command by comparing said second portion of said second database table with said second join table to generate a second intermediate results file"** as "the tuple $T_A$ is inserted into $MP_A$ , then joined with the tuples in the memory part of the $j^{th}$ entry of table B. In other words, each time a tuple $T_A$ arrives at the memory part of the $j^{th}$ entry of $MP_{AJ}$ , the tuple $T_A$ is joined with all the tuples in $MP_{BJ}$" (Column 7, lines 33-37).

Regarding claim 28, **Luo** further teaches a distributed computing system comprising:

A) wherein said first node is further configured to compare said first portion of said second database table with said second join table to generate said first intermediate results file (Column 7, lines 40-44); and

B) said second node is further configured to compare said second portion of said second database table with said first join table to generate said second intermediate results file (Column 7, lines 40-44).

The examiner notes that **Luo** teaches **"wherein said first node is further configured to compare said first portion of said second database table with said second join table to generate said first intermediate results file"** as ""the tuple $T_B$

arrives at the node, $T_B$ is inserted into $MP_B$, then joined with the tuples in the memory part of the $j^{th}$ entry of table A, as also depicted in FIG. 7. In other words, each time a tuple $T_B$ arrives at the memory part of the $j^{th}$ entry $MP_{BJ}$, the tuple $T_B$ is joined with all the tuples in $MP_{AJ}$" (Column 7, lines 40-45). The examiner further notes that **Luo** teaches **"said second node is further configured to compare said second portion of said second database table with said first join table to generate said second intermediate results file"** as ""the tuple $T_B$ arrives at the node, $T_B$ is inserted into $MP_B$, then joined with the tuples in the memory part of the $j^{th}$ entry of table A, as also depicted in FIG. 7. In other words, each time a tuple $T_B$ arrives at the memory part of the $j^{th}$ entry $MP_{BJ}$, the tuple $T_B$ is joined with all the tuples in $MP_{AJ}$" (Column 7, lines 40-45).

Regarding claim 29, **Luo** further teaches a distributed computing system comprising:

A) wherein said primary controller is further configured to generate a final results file from said first intermediate results file and said second intermediate results file (Column 9, lines 7-10).

The examiner notes that **Luo** teaches **"wherein said primary controller is further configured to generate a final results file from said first intermediate results file and said second intermediate results file"** as "Once all tuples $T_A$ and $T_B$ in the entry pair have been joined, the in-memory hash table $H_{DP}$ is freed and the operation is performed on a new entry pair $E_{AB}$, chosen randomly from the hash tables $H_A$ and $H_B$" (Column 9, lines 7-10).

Regarding claim 30, **Luo** further teaches a distributed computing system comprising:

A) wherein said primary controller is further configured to perform a post processing operation on said final results file (Column 9, lines 11-14).

The examiner notes that **Luo** teaches **"wherein said primary controller is further configured to perform a post processing operation on said final results file"** as "The analogous operations of the third stage may be performed for the case where $MP_{BJ}$ became full before $MP_{AJ}$ did" (Column 9, lines 11-13).

Regarding claim 31, **Luo** further teaches a distributed computing system comprising:

A) wherein said first portion of said first database table and said second portion of said first database table are substantially equal portions (Column 4, lines 7-16, Figures 2 and 4); and

A) said first portion of said second database table and said second portion of said second database table are substantially equal portions (Column 4, lines 7-16, Figures 2 and 4).

The examiner notes that **Luo** teaches **"wherein said first portion of said first database table and said second portion of said first database table are substantially equal portions"** as "In one embodiment, the tuples 12 of each table 14 are distributed, as evenly as possible across all the nodes 10 of the parallel RDBMS"

(Column 4, lines 8-11). The examiner further notes that **Luo** teaches **"said first portion of said second database table and said second portion of said second database table are substantially equal portions"** as "In one embodiment, the tuples 12 of each table 14 are distributed, as evenly as possible across all the nodes 10 of the parallel RDBMS" (Column 4, lines 8-11).

Regarding claim 32, **Luo** further teaches a distributed computing system comprising:

A) wherein said first storage area and said second storage area are volatile memory areas (Column 2, lines 42-50, Column 4, lines 7-16).

The examiner notes that **Luo** teaches **"wherein said first storage area-and said second storage area are volatile memory areas"** as "The tuple is typically retrieved to a volatile location, such as a memory, during query processing" (Column 2, lines 47-49).

Regarding claim 33, **Luo** further teaches a distributed computing system comprising:

A) wherein said volatile memory areas comprise random access memory (Column 2, lines 42-50, Column 4, lines 7-16).

The examiner notes that **Luo** teaches **"wherein said volatile memory areas comprise random access memory"** as "The tuple is typically retrieved to a volatile location, such as a memory, during query processing" (Column 2, lines 47-49).

Regarding claim 34, **Luo** further teaches a distributed computing system comprising:

A) wherein said database query command is a standard query language (SQL) database query command (Column 1, lines 18-23, Column 4, lines 19-25).

The examiner notes that **Luo** teaches **"wherein said database query command is a standard query language (SQL) database query command"** as "a common command for accessing data is a Structured Query Language (SQL) "select" query" (Column 1, lines 20-21" and "In the following example SQL query, an equi-join between two tables A and B is performed" (Column 4, lines 19-20).

Regarding claim 35, **Luo** teaches a distributed computing system comprising:

A) a first node having a first processor and a first storage area and configured to store a first portion of a first database table and a first portion of a second database table (Column 3, lines 65-67-Column 4, lines 1-16, Figures 2 and 4); and

B) a second node having a second processor and a second storage area and configured to store a second portion of said first database table and a second portion of said second database table (Column 3, lines 65-67-Column 4, lines 1-16, Figures 2 and 4);

C) said second node coupled to said first node Luo and a primary controller on said second node and configured to receive a primary query command (Column 3, lines 59-64, Figures 2 and 4);

D) transmit a secondary query command corresponding to said primary query command to said first processor (Column 4, lines 13-24);

E) receive a first intermediate results file from said first node and a second intermediate results file from said second processor (Column 7, lines 33-39); and

F) generate a final results file from said first intermediate results file and said second intermediate results file (Column 9, lines 7-10).

The examiner notes that **Luo** teaches **"a first node having a first processor and a first storage area and configured to store a first portion of a first database table and a first portion of a second database table"** as "A first table 14, called table A, includes tuples 12, also known as rows, in which tuples are distributed on the two nodes 10*a* and 10*b*. Tuples 12*a* of table A ($T_A$) are found on one node 10*a*, while the remaining tuples 12*b* of table A are found on another node 10*b*. Likewise, a second table 14, called table B, includes tuples 12' ($T_B$) are also distributed on at least two nodes 10*a* and 10*b*. One set of tuples 12*a*' of table B are on one node 10*a* while the remaining tuples 12*b*' of table B are on another node 10*b*" (Column 3, lines 65-67-Column 4, lines 1-6). The examiner further notes that **Luo** teaches **"a second node having a second processor and a second storage area and configured to store a second portion of said first database table and a second portion of said second database table"** as "A first table 14, called table A, includes tuples 12, also known as rows, in which tuples are distributed on the two nodes 10*a* and 10*b*. Tuples 12*a* of table A ($T_A$) are found on one node 10*a*, while the remaining tuples 12*b* of table A are found on another node 10*b*. Likewise, a second table 14, called table B, includes tuples 12'

($T_B$) are also distributed on at least two nodes 10*a* and 10*b*. One set of tuples 12*a*' of table B are on one node 10*a* while the remaining tuples 12*b*' of table B are on another node 10*b*" (Column 3, lines 65-67-Column 4, lines 1-6). The examiner further notes that **Luo** teaches **"said second node coupled to said first node Luo and a primary controller on said second node and configured to receive a primary query command"** as "Each node 10 includes a processor 30, for executing application programs, such as database management software" (Column 3, lines 62-64). The examiner further notes that **Luo** teaches **"transmit a secondary query command corresponding to said primary query command to said first processor"** as "Each node 10 additionally includes a memory 18, to which the tuples 12 may be transferred, such as during a join or other query processing operation" (Column 4, lines 13-16). The examiner further notes that **Luo** teaches **"receive a first intermediate results file from said first node and a second intermediate results file from said second processor"** as "the tuple $T_A$ is inserted into $MP_A$ , then joined with the tuples in the memory part of the $j^{th}$ entry of table B. In other words, each time a tuple $T_A$ arrives at the memory part of the $j^{th}$ entry of $MP_{AJ}$ , the tuple $T_A$ is joined with all the tuples in $MP_{BJ}$" (Column 7, lines 33-37). The examiner further notes that **Luo** teaches **"generate a final results file from said first intermediate results file and said second intermediate results file"** as "Once all tuples $T_A$ and $T_B$ in the entry pair have been joined, the in-memory hash table $H_{DP}$ is freed and the operation is performed on a new entry pair $E_{AB}$, chosen randomly from the hash tables $H_A$ and $H_B$" (Column 9, lines 7-10).

Regarding claim 36, **Luo** further teaches a distributed computing system comprising:

A) wherein said first node is further configured to generate a first join table from said first portion of said first database table in accordance with said join table definition (Column 7, lines 19-24); and

B) said second node is further configured to generate a second join table from said second portion of said first database table in accordance with said join table definition (Column 7, lines 19-24).

The examiner notes that **Luo** teaches **"wherein said first node is further configured to generate a first join table from said first portion of said first database table in accordance with said join table definition"** as "entry 22*a* from hash table 20*a* processes tuples 12 for table A while entry 22*b* from hash table 20*b* processes tuples 12' for table B" (Column 7, lines 19-22). The examiner further notes that **Luo** teaches **"said second node is further configured to generate a second join table from said second portion of said first database table in accordance with said join table definition"** as "entry 22*a* from hash table 20*a* processes tuples 12 for table A while entry 22*b* from hash table 20*b* processes tuples 12' for table B" (Column 7, lines 19-22).

Regarding claim 37, **Luo** further teaches a distributed computing system comprising:

A) wherein said first node is further configured to compare said first portion of said second database table with said first join table to generate a first intermediate results file (Column 7, lines 33-39); and

B) said second node is further configured to compare said second portion of said second database table with said second join table to generate a second intermediate results file (Column 7, lines 33-39).

The examiner notes that **Luo** teaches **"wherein said first node is further configured to compare said first portion of said second database table with said first join table to generate a first intermediate results file"** as "the tuple $T_A$ is inserted into $MP_A$ , then joined with the tuples in the memory part of the $j^{th}$ entry of table B. In other words, each time a tuple $T_A$ arrives at the memory part of the $j^{th}$ entry of $MP_{AJ}$ , the tuple $T_A$ is joined with all the tuples in $MP_{BJ}$" (Column 7, lines 33-37). The examiner further notes that **Luo** teaches **"said second node is further configured to compare said second portion of said second database table with said second join table to generate a second intermediate results file"** as "the tuple $T_A$ is inserted into $MP_A$ , then joined with the tuples in the memory part of the $j^{th}$ entry of table B. In other words, each time a tuple $T_A$ arrives at the memory part of the $j^{th}$ entry of $MP_{AJ}$ , the tuple $T_A$ is joined with all the tuples in $MP_{BJ}$" (Column 7, lines 33-37).

Regarding claim 38, **Luo** further teaches a distributed computing system comprising:

A) wherein said first node is further configured to compare said first portion of said second database table with said second join table to generate said first intermediate results file (Column 7, lines 40-44); and

B) said second node is further configured to compare said second portion of said second database table with said first join table to generate said second intermediate results file (Column 7, lines 40-44).

The examiner notes that **Luo** teaches **"wherein said first node is further configured to compare said first portion of said second database table with said second join table to generate said first intermediate results file"** as ""the tuple $T_B$ arrives at the node, $T_B$ is inserted into $MP_B$, then joined with the tuples in the memory part of the $j^{th}$ entry of table A, as also depicted in FIG. 7. In other words, each time a tuple $T_B$ arrives at the memory part of the $j^{th}$ entry $MP_{BJ}$, the tuple $T_B$ is joined with all the tuples in $MP_{AJ}$" (Column 7, lines 40-45). The examiner further notes that **Luo** teaches **"said second node is further configured to compare said second portion of said second database table with said first join table to generate said second intermediate results file"** as ""the tuple $T_B$ arrives at the node, $T_B$ is inserted into $MP_B$, then joined with the tuples in the memory part of the $j^{th}$ entry of table A, as also depicted in FIG. 7. In other words, each time a tuple $T_B$ arrives at the memory part of the $j^{th}$ entry $MP_{BJ}$, the tuple $T_B$ is joined with all the tuples in $MP_{AJ}$" (Column 7, lines 40-45).

Regarding claim 39, **Luo** further teaches a distributed computing system comprising:

A) wherein said secondary query command is a standard query language (SQL) database query command (Column 1, lines 18-23, Column 4, lines 19-25).

The examiner notes that **Luo** teaches **"wherein said secondary query command is a standard query language (SQL) database query command"** as "a common command for accessing data is a Structured Query Language (SQL) "select" query" (Column 1, lines 20-21" and "In the following example SQL query, an equi-join between two tables A and B is performed" (Column 4, lines 19-20).

Regarding claim 40, **Luo** further teaches a distributed computing system comprising:

A) wherein said primary controller is further configured to perform a post processing operation on said final results file (Column 9, lines 11-14).

The examiner notes that **Luo** teaches **"wherein said primary controller is further configured to perform a post processing operation on said final results file"** as "The analogous operations of the third stage may be performed for the case where $MP_{BJ}$ became full before $MP_{AJ}$ did" (Column 9, lines 11-13).

Regarding claim 41, **Luo** further teaches a distributed computing system comprising:

A) wherein said first portion of said first database table and said second portion of said first database table are substantially equal portions (Column 4, lines 7-16, Figures 2 and 4); and

A) said first portion of said second database table and said second portion of said second database table are substantially equal portions (Column 4, lines 7-16, Figures 2 and 4).

The examiner notes that **Luo** teaches **"wherein said first portion of said first database table and said second portion of said first database table are substantially equal portions"** as "In one embodiment, the tuples 12 of each table 14 are distributed, as evenly as possible across all the nodes 10 of the parallel RDBMS" (Column 4, lines 8-11). The examiner further notes that **Luo** teaches **"said first portion of said second database table and said second portion of said second database table are substantially equal portions"** as "In one embodiment, the tuples 12 of each table 14 are distributed, as evenly as possible across all the nodes 10 of the parallel RDBMS" (Column 4, lines 8-11).

Regarding claim 42, **Luo** further teaches a distributed computing system comprising:

A) wherein said first storage area and said second storage area are volatile memory areas (Column 2, lines 42-50, Column 4, lines 7-16).

The examiner notes that **Luo** teaches **"wherein said first storage area-and said second storage area are volatile memory areas"** as "The tuple is typically retrieved to a volatile location, such as a memory, during query processing" (Column 2, lines 47-49).

Regarding claim 43, **Luo** further teaches a distributed computing system comprising:

A) wherein said volatile memory areas comprise random access memory (Column 2, lines 42-50, Column 4, lines 7-16).

The examiner notes that **Luo** teaches **"wherein said volatile memory areas comprise random access memory"** as "The tuple is typically retrieved to a volatile location, such as a memory, during query processing" (Column 2, lines 47-49).

Regarding claim 44, **Luo** further teaches a distributed computing system comprising:

A) wherein said primary query command is a standard query language (SQL) database query command (Column 1, lines 18-23, Column 4, lines 19-25).

The examiner notes that **Luo** teaches **"wherein said primary query command is a standard query language (SQL) database query command"** as "a common command for accessing data is a Structured Query Language (SQL) "select" query" (Column 1, lines 20-21" and "In the following example SQL query, an equi-join between two tables A and B is performed" (Column 4, lines 19-20).

Regarding claim 45, **Luo** further teaches a distributed computing system comprising:

A) wherein said secondary query command is a standard query language (SQL) database query command (Column 1, lines 18-23, Column 4, lines 19-25).

The examiner notes that **Luo** teaches **"wherein said secondary query command is a standard query language (SQL) database query command"** as "a common command for accessing data is a Structured Query Language (SQL) "select" query" (Column 1, lines 20-21" and "In the following example SQL query, an equi-join between two tables A and B is performed" (Column 4, lines 19-20).

Regarding claim 46, **Luo** further teaches a distributed computing system comprising:

A) wherein said secondary query command is a standard query language (SQL) database query command (Column 1, lines 18-23, Column 4, lines 19-25).

The examiner notes that **Luo** teaches **"wherein said secondary query command is a standard query language (SQL) database query command"** as "a common command for accessing data is a Structured Query Language (SQL) "select" query" (Column 1, lines 20-21" and "In the following example SQL query, an equi-join between two tables A and B is performed" (Column 4, lines 19-20).

Regarding claim 47, **Luo** teaches a distributed computing system comprising:

A) a first logical processor for comparing in response to a database query command said first portion of said first database table with said first portion of said second database table (Column 7, lines 33-39); and

B) for comparing said first portion of said first database table with said second portion of said second database table to generate a first portion of a results file (Column 7, lines 33-39);

C) a second logical processor for comparing in response to said database query command said second portion of said first database table with said first portion of said second database table (Column 7, lines 33-39); and

D) for comparing said second portion of said first database table with said second portion of said second database table to generate a second portion of said results file (Column 7, lines 33-39); and

E) a front end processor for receiving a database query command (Column 3, lines 59-64, Figures 2 and 4); and

F) for executing post-processing operations on said results file to remove duplicate matching records (Column 9, lines 11-14).

The examiner notes that **Luo** teaches **"a first logical processor for comparing in response to a database query command said first portion of said first database table with said first portion of said second database table"** as "the tuple $T_A$ is inserted into $MP_A$ , then joined with the tuples in the memory part of the $j^{th}$ entry of table B. In other words, each time a tuple $T_A$ arrives at the memory part of the $j^{th}$ entry of $MP_{AJ}$ , the tuple $T_A$ is joined with all the tuples in $MP_{BJ}$" (Column 7, lines 33-37). The examiner further notes that **Luo** teaches **"for comparing said first portion of said first database table with said second portion of said second database table to generate a first portion of a results file"** as "the tuple $T_A$ is inserted into $MP_A$ , then

joined with the tuples in the memory part of the $j^{th}$ entry of table B. In other words, each time a tuple $T_A$ arrives at the memory part of the $j^{th}$ entry of $MP_{AJ}$ , the tuple $T_A$ is joined with all the tuples in $MP_{BJ}$" (Column 7, lines 33-37). The examiner further notes that **Luo** teaches **"a second logical processor for comparing in response to said database query command said second portion of said first database table with said first portion of said second database table"** as "the tuple $T_A$ is inserted into $MP_A$ , then joined with the tuples in the memory part of the $j^{th}$ entry of table B. In other words, each time a tuple $T_A$ arrives at the memory part of the $j^{th}$ entry of $MP_{AJ}$ , the tuple $T_A$ is joined with all the tuples in $MP_{BJ}$" (Column 7, lines 33-37). The examiner further notes that **Luo** teaches **"for comparing said second portion of said first database table with said second portion of said second database table to generate a second portion of said results file"** as "the tuple $T_A$ is inserted into $MP_A$ , then joined with the tuples in the memory part of the $j^{th}$ entry of table B. In other words, each time a tuple $T_A$ arrives at the memory part of the $j^{th}$ entry of $MP_{AJ}$ , the tuple $T_A$ is joined with all the tuples in $MP_{BJ}$" (Column 7, lines 33-37). The examiner further notes that **Luo** teaches **"a front end processor for receiving a database query command"** as "Each node 10 includes a processor 30, for executing application programs, such as database management software" (Column 3, lines 62-64). The examiner further notes that **Luo** teaches **"for executing post-processing operations on said results file to remove duplicate matching records"** as "The analogous operations of the third stage may be performed for the case where $MP_{BJ}$ became full before $MP_{AJ}$ did" (Column 9, lines 11-13).

Regarding claim 48, **Luo** further teaches a distributed computing system comprising:

A) wherein said database query command is a standard query language (SQL) database query command (Column 1, lines 18-23, Column 4, lines 19-25).

The examiner notes that **Luo** teaches **"wherein said database query command is a standard query language (SQL) database query command"** as "a common command for accessing data is a Structured Query Language (SQL) "select" query" (Column 1, lines 20-21" and "In the following example SQL query, an equi-join between two tables A and B is performed" (Column 4, lines 19-20).

Regarding claim 49, **Luo** teaches a distributed computing system comprising:

A) a first logical processor having an associated first storage area and configured to store a first database table (Column 3, lines 65-67-Column 4, lines 1-16, Figures 2 and 4);

B) a second logical processor having an associated second storage area and configured to store a second database table (Column 3, lines 65-67-Column 4, lines 1-16, Figures 2 and 4); and

C) a primary controller coupled to said first logical processor and said second logical processor and configured to receive a primary query command (Column 3, lines 59-64, Figures 2 and 4);

D) transmit a secondary query command corresponding to said primary query command to said first logical processor and said second logical processor (Column 4, lines 13-24);

E) receive a first intermediate results file from said first logical processor and a second intermediate results file from said second logical processor (Column 7, lines 33-39); and

F) generate a final results file from said first intermediate results file and said second intermediate results file (Column 9, lines 7-10).

The examiner notes that **Luo** teaches **"a first logical processor having an associated first storage area and configured to store a first database table"** as "A first table 14, called table A, includes tuples 12, also known as rows, in which tuples are distributed on the two nodes 10*a* and 10*b*. Tuples 12*a* of table A ($T_A$) are found on one node 10*a*, while the remaining tuples 12*b* of table A are found on another node 10*b*. Likewise, a second table 14, called table B, includes tuples 12' ($T_B$) are also distributed on at least two nodes 10*a* and 10*b*. One set of tuples 12*a*' of table B are on one node 10*a* while the remaining tuples 12*b*' of table B are on another node 10*b*" (Column 3, lines 65-67-Column 4, lines 1-6). The examiner further notes that **Luo** teaches **"a second logical processor having an associated second storage area and configured to store a second database table"** as "A first table 14, called table A, includes tuples 12, also known as rows, in which tuples are distributed on the two nodes 10*a* and 10*b*. Tuples 12*a* of table A ($T_A$) are found on one node 10*a*, while the remaining tuples 12*b* of table A are found on another node 10*b*. Likewise, a second table 14, called table B, includes tuples 12' ($T_B$) are also distributed on at least two

nodes 10*a* and 10*b*. One set of tuples 12*a*' of table B are on one node 10*a* while the remaining tuples 12*b*' of table B are on another node 10*b*" (Column 3, lines 65-67-Column 4, lines 1-6). The examiner further notes that **Luo** teaches **"a primary controller coupled to said first logical processor and said second logical processor and configured to receive a primary query command"** as "Each node 10 includes a processor 30, for executing application programs, such as database management software" (Column 3, lines 62-64). The examiner further notes that **Luo** teaches **"transmit a secondary query command corresponding to said primary query command to said first logical processor and said second logical processor"** as "Each node 10 additionally includes a memory 18, to which the tuples 12 may be transferred, such as during a join or other query processing operation" (Column 4, lines 13-16). The examiner further notes that **Luo** teaches **"receive a first intermediate results file from said first logical processor and a second intermediate results file from said second logical processor"** as "the tuple $T_A$ is inserted into $MP_A$ , then joined with the tuples in the memory part of the $j^{th}$ entry of table B. In other words, each time a tuple $T_A$ arrives at the memory part of the $j^{th}$ entry of $MP_{AJ}$ , the tuple $T_A$ is joined with all the tuples in $MP_{BJ}$" (Column 7, lines 33-37). The examiner further notes that **Luo** teaches **"generate a final results file from said first intermediate results file and said second intermediate results file"** as "Once all tuples $T_A$ and $T_B$ in the entry pair have been joined, the in-memory hash table $H_{DP}$ is freed and the operation is performed on a new entry pair $E_{AB}$, chosen randomly from the hash tables $H_A$ and $H_B$" (Column 9, lines 7-10).

Regarding claim 50, **Luo** further teaches a distributed computing system comprising:

A) wherein said primary controller is further configured to generate a final results file from said first intermediate results file and said second intermediate results file (Column 9, lines 7-10).

The examiner notes that **Luo** teaches **"wherein said primary controller is further configured to generate a final results file from said first intermediate results file and said second intermediate results file"** as "Once all tuples $T_A$ and $T_B$ in the entry pair have been joined, the in-memory hash table $H_{DP}$ is freed and the operation is performed on a new entry pair $E_{AB}$, chosen randomly from the hash tables $H_A$ and $H_B$" (Column 9, lines 7-10).

Regarding claim 51, **Luo** further teaches a distributed computing system comprising:

A) wherein said secondary query command is a standard query language (SQL) database query command (Column 1, lines 18-23, Column 4, lines 19-25).

The examiner notes that **Luo** teaches **"wherein said secondary query command is a standard query language (SQL) database query command"** as "a common command for accessing data is a Structured Query Language (SQL) "select" query" (Column 1, lines 20-21" and "In the following example SQL query, an equi-join between two tables A and B is performed" (Column 4, lines 19-20).

Regarding claim 52, **Luo** further teaches a distributed computing system comprising:

A) wherein said primary controller is further configured to perform a post processing operation on said final results file (Column 9, lines 11-14).

The examiner notes that **Luo** teaches **"wherein said primary controller is further configured to perform a post processing operation on said final results file"** as "The analogous operations of the third stage may be performed for the case where $MP_{BJ}$ became full before $MP_{AJ}$ did" (Column 9, lines 11-13).

Regarding claim 53, **Luo** further teaches a distributed computing system comprising:

A) wherein said first storage area and said second storage area are volatile memory areas (Column 2, lines 42-50, Column 4, lines 7-16).

The examiner notes that **Luo** teaches **"wherein said first storage area-and said second storage area are volatile memory areas"** as "The tuple is typically retrieved to a volatile location, such as a memory, during query processing" (Column 2, lines 47-49).

Regarding claim 54, **Luo** further teaches a distributed computing system comprising:

A) wherein said volatile memory areas comprise random access memory (Column 2, lines 42-50, Column 4, lines 7-16).

The examiner notes that **Luo** teaches **"wherein said volatile memory areas comprise random access memory"** as "The tuple is typically retrieved to a volatile location, such as a memory, during query processing" (Column 2, lines 47-49).

Regarding claim 55, **Luo** further teaches a distributed computing system comprising:

A) a third logical processor having an associated third storage area and configured to store a third database table(Column 4, lines 7-16, Figures 2 and 4).

The examiner notes that **Luo** teaches **"a third logical processor having an associated third storage area and configured to store a third database table"** as "Both tables 14 may have additional tuples 12, distributed to additional nodes 10 of the parallel RDBMS 100. In one embodiment, the tuples 12 of each table 14 are distributed, as evenly as possible across all the nodes 10 of the parallel RDBMS" (Column 4, lines 7-11).

Regarding claim 56, **Luo** further teaches a distributed computing system comprising:

A) wherein said primary query command is a standard query language (SQL) database query command (Column 1, lines 18-23, Column 4, lines 19-25).

The examiner notes that **Luo** teaches **"wherein said primary query command is a standard query language (SQL) database query command"** as "a common command for accessing data is a Structured Query Language (SQL) "select" query" (Column 1, lines 20-21" and "In the following example SQL query, an equi-join between two tables A and B is performed" (Column 4, lines 19-20).

Regarding claim 57, **Luo** further teaches a distributed computing system comprising:

A) wherein said secondary query command is a standard query language (SQL) database query command (Column 1, lines 18-23, Column 4, lines 19-25).

The examiner notes that **Luo** teaches **"wherein said secondary query command is a standard query language (SQL) database query command"** as "a common command for accessing data is a Structured Query Language (SQL) "select" query" (Column 1, lines 20-21" and "In the following example SQL query, an equi-join between two tables A and B is performed" (Column 4, lines 19-20).

***Conclusion***

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

U.S. Patent 6,745,198 issued to **Luo et al.** on 01 June 2004. The subject matter disclosed therein is pertinent to that of claims 1-57 (e.g., methods efficient query processing for evenly partitioned database tables).

U.S. Patent 6,804,678 issued to **Luo et al.** on 12 October 2004. The subject matter disclosed therein is pertinent to that of claims 1-57 (e.g., methods efficient query processing for evenly partitioned database tables).

U.S. Patent 6,732,107 issued to **Luo et al.** on 04 May 2004. The subject matter disclosed therein is pertinent to that of claims 1-57 (e.g., methods efficient query processing for evenly partitioned database tables).

U.S. Patent 6,339,769 issued to **Cochrane et al.** on 15 January 2002. The subject matter disclosed therein is pertinent to that of claims 1-57 (e.g., methods efficient query processing for evenly partitioned database tables).

U.S. Patent 5,903,893 issued to **Kleewein et al.** on 11 May 1999. The subject matter disclosed therein is pertinent to that of claims 1-57 (e.g., methods efficient query processing for evenly partitioned database tables).

U.S. Patent 5,613,142 issued to **Matsumoto** on 18 March 1997. The subject matter disclosed therein is pertinent to that of claims 1-57 (e.g., methods efficient query processing for evenly partitioned database tables).

***Contact Information***

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mahesh Dwivedi whose telephone number is (571) 272-2731. The examiner can normally be reached on Monday to Friday 8:20 am – 4:40 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tim Vo can be reached (571) 272-3642. The fax number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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October 17, 2006

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